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(a) determining an uplink bandwidth requirement and a downlink bandwidth requirement of the communication link, wherein the uplink and downlink bandwidth requirements are determined using associated and respective uplink and downlink bandwidth utilization parameters;

(b) calculating an uplink/downlink bandwidth requirement ratio based upon the uplink and downlink bandwidth requirements of the link;

(c) allocating uplink and downlink time slots in a frame in response to the calculated uplink/downlink bandwidth ratio; and

periodically enabling uplink transmissions during the allocated uplink time slots and downlink transmissions during the allocated downlink time slots.

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42. (Amended) An apparatus for adaptively duplexing transmissions in a communication link of a wireless communication system using a time division duplexing scheme wherein transmissions are communicated in an uplink direction during uplink time slots and wherein transmissions are communicated in a downlink direction during downlink time slots, comprising:

(a) means for determining an uplink bandwidth requirement and a downlink bandwidth requirement of the communication link, wherein the uplink and downlink bandwidth requirements are determined using associated and respective uplink and downlink bandwidth utilization parameters;

(b) means, responsive to the determining means, for calculating an uplink/downlink bandwidth requirement ratio based upon the uplink and downlink bandwidth requirements of the link;

(c) means, responsive to the calculating means, for allocating uplink and downlink time slots in a frame; and

means for periodically enabling uplink transmissions during the allocated uplink time slots and downlink transmissions during the allocated downlink time slots.

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48. (Amended) A method for duplexing transmissions in a communication link using a time division duplexing scheme wherein transmissions are communicated in an uplink direction during uplink time slots and wherein transmissions are communicated in a downlink direction during downlink time slots, comprising the steps of:

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(a) determining uplink and downlink bandwidth requirements in accordance with associated and respective quality of service parameters to establishing an uplink/downlink bandwidth requirement ratio;

(b) allocating uplink and downlink time slots in a frame in response to the uplink/downlink bandwidth ratio; and

(c) periodically enabling uplink transmissions during the allocated uplink time slots and downlink transmissions during the allocated downlink time slots.

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70. (Amended) A method for monitoring and updating uplink and downlink bandwidth requirements in a wireless communication system including a base station and at least one CPE, the method comprising:

initializing the base station with an initial set of bandwidth utilization parameters, including a first estimate of the uplink and downlink bandwidth requirements of at least one CPE in a frame;

monitoring bandwidth use by the at least one CPE and the base station; and

updating the initial set of bandwidth utilization parameters with an actual set of bandwidth utilization parameters based on the monitoring.

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73. (Amended) A method for adaptively duplexing transmissions in a communication link using a time division duplexing scheme wherein transmissions are communicated in an uplink direction during uplink time slots and wherein transmissions are communicated in a downlink direction during downlink time slots, the method comprising:

determining an initial uplink bandwidth requirement and an initial downlink bandwidth requirement of the communication link;

calculating an initial uplink/downlink bandwidth requirement ratio based upon the initial uplink and initial downlink bandwidth requirements of the link;

allocating initial uplink and downlink time slots in a frame in response to the calculated initial uplink/downlink bandwidth ratio;

transmitting information during the initial uplink and downlink time slots;

determining an actual uplink bandwidth requirement and an actual downlink bandwidth requirement based on the transmission during the initial uplink and downlink time slots;

calculating an actual uplink/downlink bandwidth requirement ratio based upon the actual uplink and actual downlink bandwidth requirements of the link;

allocating actual uplink and downlink time slots in response to the calculated actual uplink/downlink bandwidth ratio; and

transmitting information during the actual uplink and downlink time slots.

74. (Amended) A wireless communication system for transmitting frames of data wherein each frame of data includes an uplink subframe portion and a downlink subframe portion using adaptive time division duplexing, the system comprising:

at least one CPE configured to demodulate the downlink subframe portion and modulate the uplink subframe portion; and

a base station configured to demodulate the uplink subframe portion and modulate the downlink subframe portion, wherein the lengths of the uplink and downlink subframe portions of each frame of data are based on the uplink bandwidth requirement of the at least one CPE and the downlink bandwidth requirement of the base station.

88. (Amended) A method for adaptively duplexing transmissions between a base station and at least one CPE using a series of uplink and downlink frames of information in an adaptive time division duplexing scheme, wherein transmissions are communicated in an uplink direction during uplink time slots and wherein transmissions are communicated in a downlink direction during downlink time slots, comprising:

selecting a first service type for an uplink transmission;

selecting a second service type for a downlink transmission;

determining an uplink bandwidth requirement that is associated with the selected first service type;

determining a downlink bandwidth requirement that is associated with the selected second service type;

calculating an uplink/downlink bandwidth requirement ratio based upon the uplink and downlink bandwidth requirements;

allocating uplink and downlink time slots in a frame in response to the calculated uplink/downlink bandwidth ratio; and

periodically enabling uplink transmissions during the allocated uplink time slots and downlink transmissions during the allocated downlink time slots.

92. (Amended) A method for adaptively duplexing transmissions in a communication link using a time division duplexing scheme wherein transmissions are communicated in an uplink direction during uplink time slots and wherein transmissions are communicated in a downlink direction during downlink time slots, the method comprising:

selecting a quality of service associated with the communication link;

determining an initial uplink bandwidth requirement and an initial downlink bandwidth requirement of the communication link based on the selected quality of service;

calculating an initial uplink/downlink bandwidth requirement ratio based upon the initial uplink and initial downlink bandwidth requirements of the link;

allocating initial uplink and downlink time slots in a frame in response to the calculated initial uplink/downlink bandwidth ratio;

transmitting information during the initial uplink and downlink time slots;

determining an actual uplink bandwidth requirement and an actual downlink bandwidth requirement based on actual bandwidth utilization during the initial uplink and downlink time slots;

calculating an actual uplink/downlink bandwidth requirement ratio based upon the actual uplink and actual downlink bandwidth requirements of the link;

allocating actual uplink and downlink time slots in response to the calculated actual uplink/downlink bandwidth ratio; and

transmitting information during the actual uplink and downlink time slots.

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REMARKS

By the foregoing amendments, Applicant has amended claims 24, 42, 48, 70, 73, 74, 88 and 92. Claims 24-96 are pending in the application and are presented for reconsideration and further examination in view of the following amendments and remarks.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned VERSION WITH MARKINGS TO SHOW CHANGES MADE. The changes are indicated by underlining insertions and deletions are ~~stricken through in red~~.

Specification

The Office Action indicated that the substitute specification filed on January 22, 2002 had not been entered on the grounds that the marked-up copy was not submitted and because "there is a significant difference between the original specification and the substitute specification." Applicant respectfully requests that the January 22, 2002 substitute specification be entered. A marked-up copy of the original specification indicating that it has been deleted in its entirety is submitted herewith.

The original specification incorporated by reference U.S. Patent Application Serial No. 08/974,376 filed on May 21, 1999. That incorporation by reference was in the section titled CROSS-REFERENCE TO RELATED APPLICATION in the originally filed specification. Such an incorporation by reference is proper pursuant to M.P.E.P. §608.01(p). The substitute specification consists of the same material incorporated by reference. Specifically, the substitute specification consists of the text of Application No. 08/974,376. Therefore, the substitute specification does not introduce any new matter.

Applicant thanks Examiner Ly and Supervisory Patent Examiner Kizou for discussing this issue by telephone on January 6, 2002. As was agreed during those telephone calls, Applicant is submitting herewith a copy of the original specification with the entire text stricken through to signify the canceling of all the text of that specification.

If the Examiner has any questions regarding entry of the substitute specification, the Examiner is encouraged to contact the undersigned by telephone.

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Drawings

Similarly, the proposed substitute sheets of drawings filed on January 22, 2002 were disapproved by the Examiner on the grounds that they introduce new matter into the drawings. Applicant respectfully requests that the substitute drawings be approved.

The substitute drawings are the drawings from Application No. 08/974,376 which, as was noted above, was incorporated by reference in the specification as originally filed. Therefore, the substitute drawings consist of the same material incorporated by reference and do not introduce new matter.

If the Examiner has any further questions or concerns regarding entry of the substitute drawings, the Examiner is encouraged to contact the undersigned by telephone.

Rejections under §102(e) for Anticipation

In the Office Action, claims 24-33, 38-71, 73-77, 88-90, 92, 95, and 96 were rejected as being anticipated by U.S. Patent No. 6,097,733 to Basu et al. Applicant respectfully submits that the pending claims are patentable over Basu et al. Applicant also reserves the right to challenge whether Basu et al. is available as prior art under §102(e).

Applicant has amended independent claims 24, 42, 48, 70, 73, 74, 88 and 92 to clarify that those claimed methods and apparatuses allocate uplink and downlink bandwidth within the same frame. For example, amended claim 26 recites, among other limitations, "calculating an uplink/downlink bandwidth requirement ratio based upon the uplink and downlink bandwidth requirements of the link and allocating uplink and downlink time slots in a frame in response to the calculated uplink/downlink bandwidth ratio." For example, if in one frame 75% of the available bandwidth over the entire frame is allocated for the uplink, then only 25% of the bandwidth in the same frame is allocated for the downlink. In this case the uplink/downlink bandwidth ratio for the current frame is greater than 1. In Applicant's methods and systems, this ratio can be varied from frame to frame due to, for example, variations in the demand for uplink and downlink. In this way, Applicant's methods and systems are capable of allocating between uplink and downlink in a frame in an asymmetric fashion.

Among other aspects of the claims, the claimed calculating a bandwidth ratio and allocating bandwidth in a frame as set forth above is not disclosed or taught by Basu et al. For example, Basu et al. does not even include the words "frame", "uplink", or "downlink" in its

entire specification. Basu et al. does allocate bandwidth to wireless mobile units as illustrated by Figure 6 in Basu et al. However, as explained below, Basu et al. does not teach or suggest allocating bandwidth in a frame between uplink and downlink as set forth in amended claim 24.

In Basu et al., each terminal endpoint identifier (TEI) is a logical connection between the base station and a mobile unit. (see col. 11, ll. 28-32) In Figure 6, the connection between the base station 600 and wireless mobile unit 604 includes four logical links. Three of the four links are multimedia links. (see col. 11, ll. 49-51) These "three distinct logical paths provide three segments of bandwidth for multimedia communications between the base station 600 and the wireless mobile unit 604." (col. 11, ll. 51-54) Nowhere does Basu et al. disclose dividing its logical links into uplink slots and downlink slots. Moreover, Basu et al. does not disclose allocating both the uplink slots and the downlink slots in a frame as in amended claim 24.

Thus, Applicant submits that the features of amended claim 24, as presented herein, are neither taught nor would they have been made obvious by Basu et al. Applicant notes that independent claims 42, 48, 70, 73, 74, 88 and 92 have been amended to include limitations similar to those discussed above with respect to claim 24. Accordingly, for the reasons set forth above, Applicant submits that claims 42, 48, 70, 73, 74, 88 and 92 also define subject matter that is patentable over the art of record.

In view of the comments above, Applicant asserts that independent claims 52 and 62 are patentable over the art of record.

Furthermore, since claims 25-41, 43-47, 49-51, 53-61, 63-69, 71, 75-77, 89-91, and 93-96 depend from claims 24, 42, 48, 52, 62, 70, 73, 74, 88, and 92, Applicant respectfully submits that these claims also define subject matter which is patentable over the art of record. Accordingly, Applicant respectfully submits that claims 24-71, 73-77, and 88-96 are now in condition for allowance.

§103 Rejections

In the Office Action, claims 34-37, 72, 91, and 93-95 were rejected as being obvious in view of the combination of Basu et al. and U.S. Patent No. 5,640,395 to Hamalainen et al. All of the claims rejected under §103, except for independent claim 72, depend from independent claims 24, 88, and 92. These dependent claims are patentable for at least the same reasons as the

claims from which they depend as discussed above under §102. Applicant reserves the right to challenge whether Hamalainen is available as prior art under §103.

The Office Action admits that Basu et al. does not disclose the allocation approach described in claim 72. The Office Action states: "Basu does not disclose duration of downlink frame request exceeds uplink frame request, extending and notifying at least one CPE of the extended downlink frame and reducing the uplink frame." The Office Action relied upon the Hamalainen reference to disclose these features. However, Hamalainen does not teach or suggest the missing features.

The portion of claim 1 from Hamalainen et al., which was cited in the Office Action as the basis of the rejection, is reproduced below.

in the TDMA frames there is assigned at any given time a variable number of time slots designated for packet data transmission, the number of assigned time slots being a function of one of a symmetry and an asymmetry of the packet data transmission, and also on a total demand for packet data transmission in the cell.

Based upon claim 1 of Hamalainen, the Office Action states that "Hamalainen discloses that in TDMA frames, there is assigned a variable number of time slots designated for packet data transmission, the number of assigned time slots being a function of one of a symmetry and an asymmetry of the packet data transmission, and also on a total demand for packet data transmission in the cell." The Office Action then drops the suffix "s" from the word "frames" and states that "in a TDMA frame, some slots are designated for uplink transmission and some slots are designated for downlink transmissions." (Emphasis added). The Office Action then correctly states: "A number of time slots assigned can vary according to the demand for data transmission." However, this variation in number of time slots relates to the number of time slots assigned to packet data, not to an uplink and a downlink.

Hamalainen's claim 1 describes that the number of time slots assigned in an uplink frame to packet data can be different than the number of time slots assigned in a downlink frame to packet data. Since the length of the uplink and downlink frames do not appear to vary in Hamalainen, the time slots unassigned to packet data in the uplink and downlink frames are assigned to a different type of data. Nowhere does claim 1, nor the rest of specification, vary the length of the uplink frame or the downlink frame. Applicant's claim 72 comprises "extending the subsequent downlink frame and reducing the subsequent uplink frame by a similar portion of

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time, such that the total duration of the subsequent uplink and downlink frames is unchanged” which is not disclosed in, nor taught by the references of record.

In contrast to a mobile unit being assigned more slots in an uplink frame than in a downlink frame or vice versa, as described in Hamalainen, the method of claim 72 can vary the overall durations of the uplink and downlink frames. In this way, the duration of the uplink frame can be greater than the duration of the downlink frame, or vice versa. However, the total duration of the combined uplink and downlink frames is unchanged. This is very different than allocating more or less of a frame to different types of data.

Therefore, Applicant respectfully submits that claim 72 is not obvious in view of the references of record.

CONCLUSION

For the foregoing reasons, it is respectfully submitted that the rejections set forth in the outstanding Office Action are inapplicable to the present claims and specification. Accordingly, early issuance of a Notice of Allowance is most earnestly solicited.

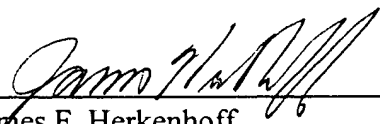
The undersigned has made a good faith effort to respond to all of the rejections in the case and to place the claims in condition for immediate allowance. Nevertheless, if any undeveloped issues remain or if any issues require clarification, the Examiner is respectfully requested to call Applicant's attorney, James F. Herkenhoff at (619) 687-8663 (direct line) in order to resolve such issue promptly.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

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